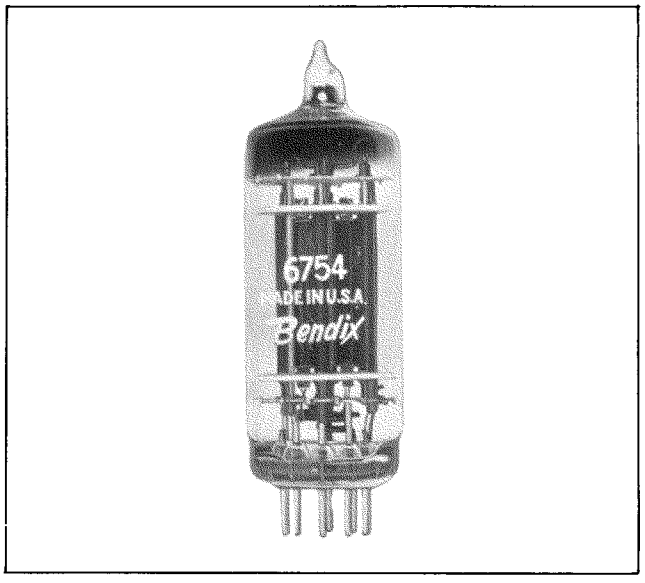
6754
Bendix Type TE-36
(Generic Type 412A)

RELIABLE HARD GLASS MINIATURE FULL-WAVE RECTIFIER



ELECTRICAL RATINGS*

Heater voltage**	6.3 volts
Heater current	1.0 amp
Peak inverse voltage	1450 volts
Peak plate current—(per plate)	330 mA
Peak surge current—(per plate)	1.1 amps
DC heater-cathode potential	500 volts (max.)
Cathode heating time	45 sec.
Total effective plate supply impedance—(per plate)	See Rating Chart 3

For maximum current and voltage ratings, refer to Rating Chart 1.

*To obtain greatest life expectancy from tube, avoid designs where the tube is subjected to all maximum ratings simultaneously.

**Voltage should not fluctuate more than ±5%.

TYPICAL OPERATION

Input to Filter

	Capacitor	Choke
Heater voltage (volts)	6.3	6.3
Heater current (amperes)	1.0	1.0
RMS plate supply voltage (volts per plate)	325	450
Input capacitor (μf)	4	—
Input choke (henries)	—	10
DC output current (mA)	100	100
DC output voltage (volts)		
At half-load current (50 mA)	375	395
At full-load current (100 mA)	325	385

DESCRIPTION

This miniature, full-wave, high-vacuum rectifier is one of the Bendix Red Bank line of reliable vacuum tubes specifically designed for aircraft, military and industrial applications where freedom from early failures, long service life, and uniform operating characteristics are extremely important. Each tube is given a 45-hour run-in under various overload, vibration, and shock conditions likely to be encountered in service. This run-in serves to reduce early failures by eliminating tubes with any minor defects that might lead to failure under actual operating conditions.

In addition, this tube is designed for use in equipment with high ambient temperatures and where high levels of vibration, shock and other accelerations are encountered. Careful exhaust to a high degree of vacuum with thorough outgassing of all elements with electron bombardment is employed to ensure long life expectancy. A hard glass (nonex) bulb and stem with nickel pins are used. These, together with a conservative design center of cathode temperature, permit operation of these tubes up to bulb temperatures of 300°C, in contrast to an average of 175°C for soft glass bulbs. In addition, because of the lower expansion of the tungsten-nonex seal (about one-third that of conventional lime or lead glass), greater resistance to thermal shock is obtained. The nickel pins are gold plated to assure excellent contact resistance throughout life with freedom from corrosion.

This tube employs pressed ceramic spacers, instead of micas, for element separation. Conventional micas are used to snub the tube structure with respect to the bulb. These micas do not touch the hot elements of the tube which avoids deterioration of the mica and consequent loss of emission. Mica in contact with the hot cathode deteriorates even more rapidly under shock and vibration. Ceramic eliminates this problem and, furthermore, reduces damage caused by fatigue failure of parts.

MECHANICAL DATA

Base	9 Pin Miniature Nonex Glass—Gold Plated Pins
Bulb	Nonex Glass—T6½
Max. Overall Length	2¾"
Max. Seated Height	2½"
Max. Diameter	⅞"
Mounting Position	any
Max. Altitude***	80,000 feet
Max. Bulb Temperature	300°C
Max. Impact Shock	500 G
Max. Vibrational Acceleration (100 hour shock excited fatigue test, sample basis)	50 G
Life Expectancy	10,000 hrs.

***See altitude chart on page 3.

THE Bendix CORPORATION
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ELECTRICAL CHARACTERISTICS AND TEST DATA

TEST CONDITIONS AND CHARACTERISTIC LIMITS

All Tubes are Stabilized for 45 hours under Test Conditions A & B and 2 G Vibration at 30 cps prior to 100% Testing.

CHARACTERISTIC	TEST CONDITIONS	SYMBOL	MIN.	DESIGN CENTER	MAX.	UNITS
PRODUCTION TESTS						
Heater Current	A	If	.90	1.0	1.1	Aac
Heater-Cathode Leakage	A	Ihk	—	—	± 50	μAdc
Operation	B	Io	95	100	—	mAdc
Emission	C	Is	75	—	—	mAdc
Short and Continuity						
DESIGN TESTS						
Vibration 2.5 G, 25 cps						
Insulation of Electrodes	D	R	100	—	—	megohms
Heater-Cathode Leakage	E	Ihk	—	—	100	μAdc

TEST CONDITIONS	Ef	Epp/p	Es	Ep	RL	CL	Zpp/p	Ehk
Units	V	Vac	Vdc	Vdc	ohms	uf	ohms	Vdc
A	6.3							± 500
B	6.3	350			3890	4	Adjust	
C	6.3		15					
D	6.3			1500				
E	6.3							1500

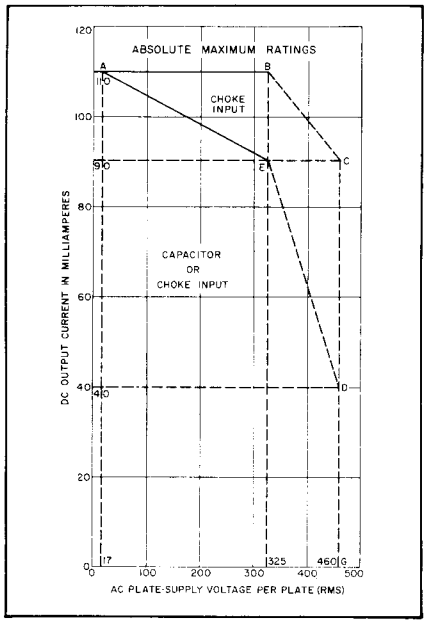
SPECIAL TESTS

In addition to the production and design tests shown under "Electrical Characteristics and Test Data", other tests are performed on a sampling basis to assure a high out-going quality level. See below:

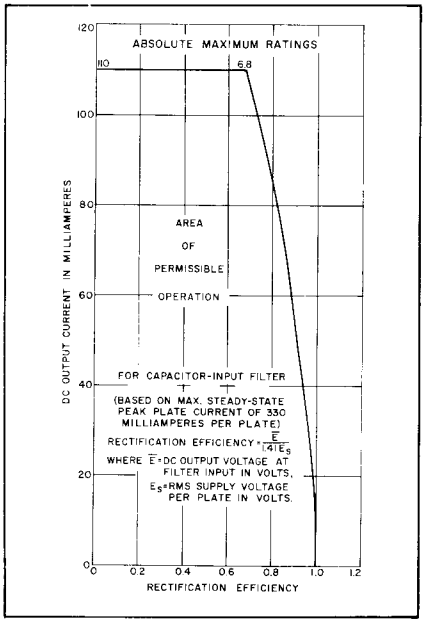
TEST	CONDITION	DURATION
Heater Cycling Life Test	On 2½ min. Off 2½ min. Ef = 7.0 Vac	3,000 On-Off cycles
Glass Strain Test	Boiling water to Ice water	3 minutes in each
High Level Fatigue Test	50 G Shock Excitation: 18/sec. rep. rate	100 hours
Altitude Test	60,000 Feet	5 minutes
High Temp. Life Test	Under "Test Conditions" Bulb Temp. 300°C	1,000 hours
Life Expectancy Test	Under Test Conditions	5,000 hours
Mount Inspection	100% Test-Microscopic Inspection of 15 possible Trouble Points	

EFFECT ON LIFE OF INCREASED RATINGS

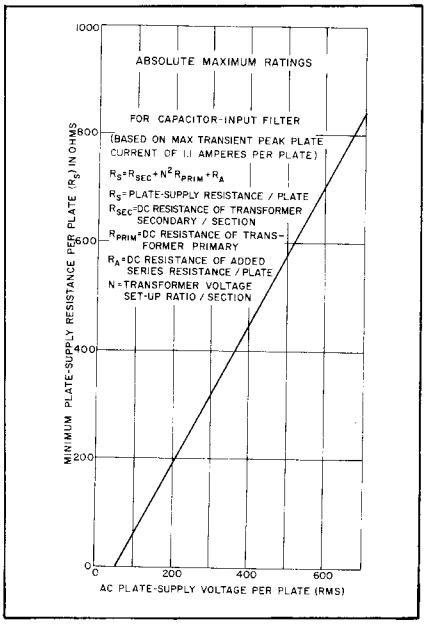
See also Application Notes	OPERATING CONDITIONS		
RATING OR CHARACTERISTIC	CONSERVATIVE	TYPICAL	MAXIMUM
Heater Voltage	6.3 V ± 2%	6.3 V ± 5%	6.3 V ± 10%
H-K Voltage	425 V	450 V	500 V
Peak Plate Current (per plate)	225 mA	300 mA	330 mA
Peak Plate Inverse Voltage	1000 V	1250 V	1450 V
Output Current (per Tube)	85 mA	90 mA	100 mA
Bulb Temperature	175°C	225°C	300°C
Altitude	0-20,000 ft.	60,000 ft.	80,000 ft.
Vibration	2 G	5 G	10 G
LIFE EXPECTANCY	MAXIMUM	HIGH	MEDIUM



RATING CHART 1



RATING CHART 2



RATING CHART 3

FULL-WAVE RECTIFIER

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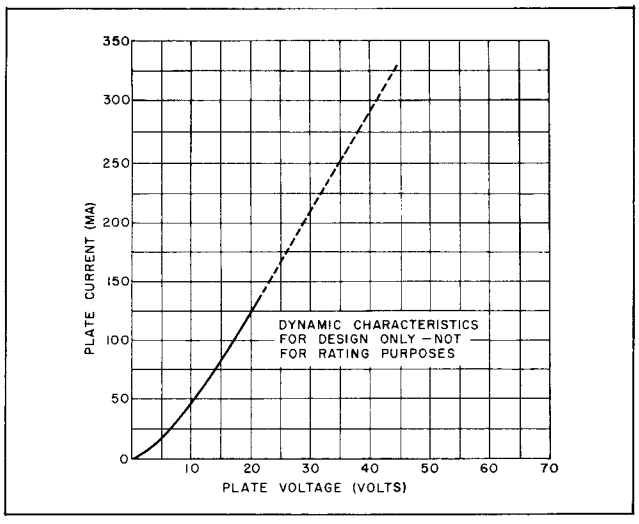
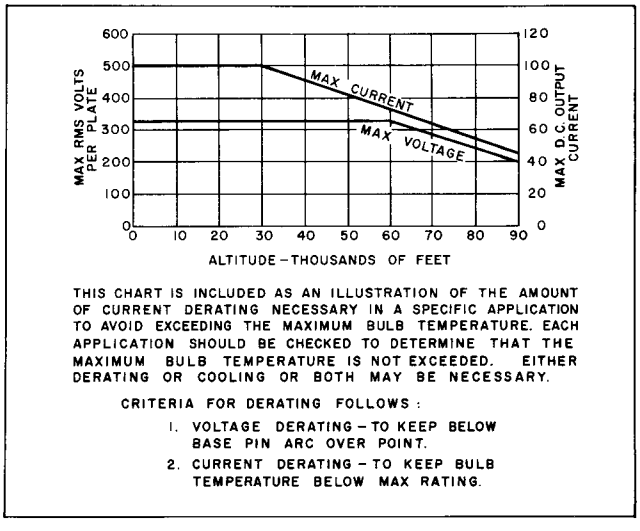


AVERAGE PLATE CHARACTERISTICS



THIS CHART IS INCLUDED AS AN ILLUSTRATION OF THE AMOUNT OF CURRENT DERATING NECESSARY IN A SPECIFIC APPLICATION TO AVOID EXCEEDING THE MAXIMUM BULB TEMPERATURE. EACH APPLICATION SHOULD BE CHECKED TO DETERMINE THAT THE MAXIMUM BULB TEMPERATURE IS NOT EXCEEDED. EITHER DERATING OR COOLING OR BOTH MAY BE NECESSARY.

CRITERIA FOR DERATING FOLLOWS:

1. VOLTAGE DERATING – TO KEEP BELOW BASE PIN ARC OVER POINT.
2. CURRENT DERATING – TO KEEP BULB TEMPERATURE BELOW MAX RATING.

ALTITUDE RATINGS

APPLICATION NOTES

For reliable operation special consideration should be given to the maximum ratings of the 6754. These ratings are limiting absolute values and if exceeded may seriously impair the reliability of the tube. Therefore, the equipment designer should determine an average design value for each rating so that variations in supply voltages, load, and components do not cause the absolute values to be exceeded. The bulb temperature rating is an extremely important characteristic which should not be exceeded if expected life is to be achieved.

Reliability and performance will be jeopardized if filament voltage ratings are exceeded. Life and reliability of performance are directly related to the degree that regulation of the heater voltage is maintained at its center rated value.

From Rating Chart 1, operating conditions should be selected to insure usage within the area of permissible operation with choke or capacitor inputs.

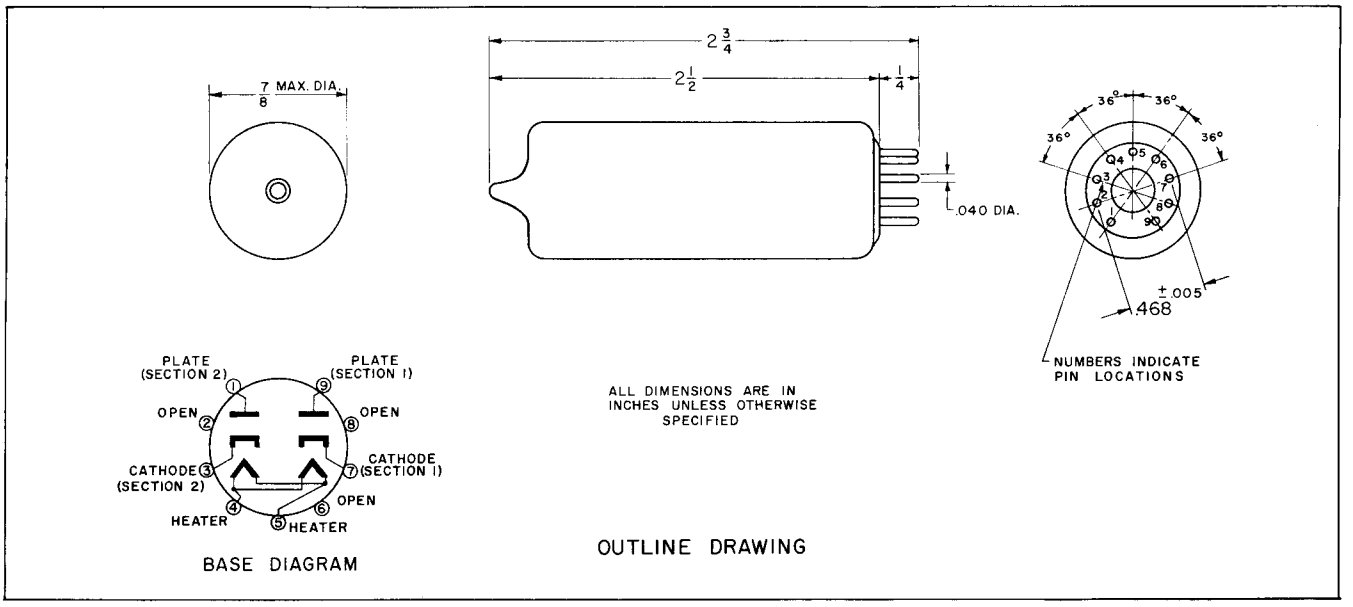
To insure that the maximum peak plate current is not exceeded a choice of operating values of d-c output current per plate and rectification efficiency should be made such that they fall within the area of permissible operation of Rating Chart 2.

Rating Chart 3 graphically represents the relationship between the maximum a-c plate supply voltage per plate and the minimum plate supply resistance per plate to prevent maximum transient currents from exceeding the peak surge current rating of the tube. The plate supply resistance $Rs = R(sec) + N^2R(pri) + Ra$, where

R(sec) = d-c resistance of each section of transformer secondary,
N = Transformer voltage step-up ratio per section,
R(pri) = d-c resistance of transformer primary,
Ra = d-c resistance of added series resistance per plate.

The addition of inductance would allow a reduction of the minimum value specified for Rs provided the reactance added is not too small as to cause the maximum peak surge plate current and maximum steady-state peak plate current ratings to be exceeded.

The increased rating chart is presented to emphasize the dangers of operating simultaneously at or near all maxima. In general, the effect on life of operation at increased ratings is additive and cumulative. Interpolation within this chart will give the designer a general idea of the life expectancy and reliability of his application. Each proposed application should be life tested under maximum environmental conditons in order to check that the design gives the desired reliability. When conservatively used this tube has a life expectancy of 10,000 hours.



OUTLINE DRAWING

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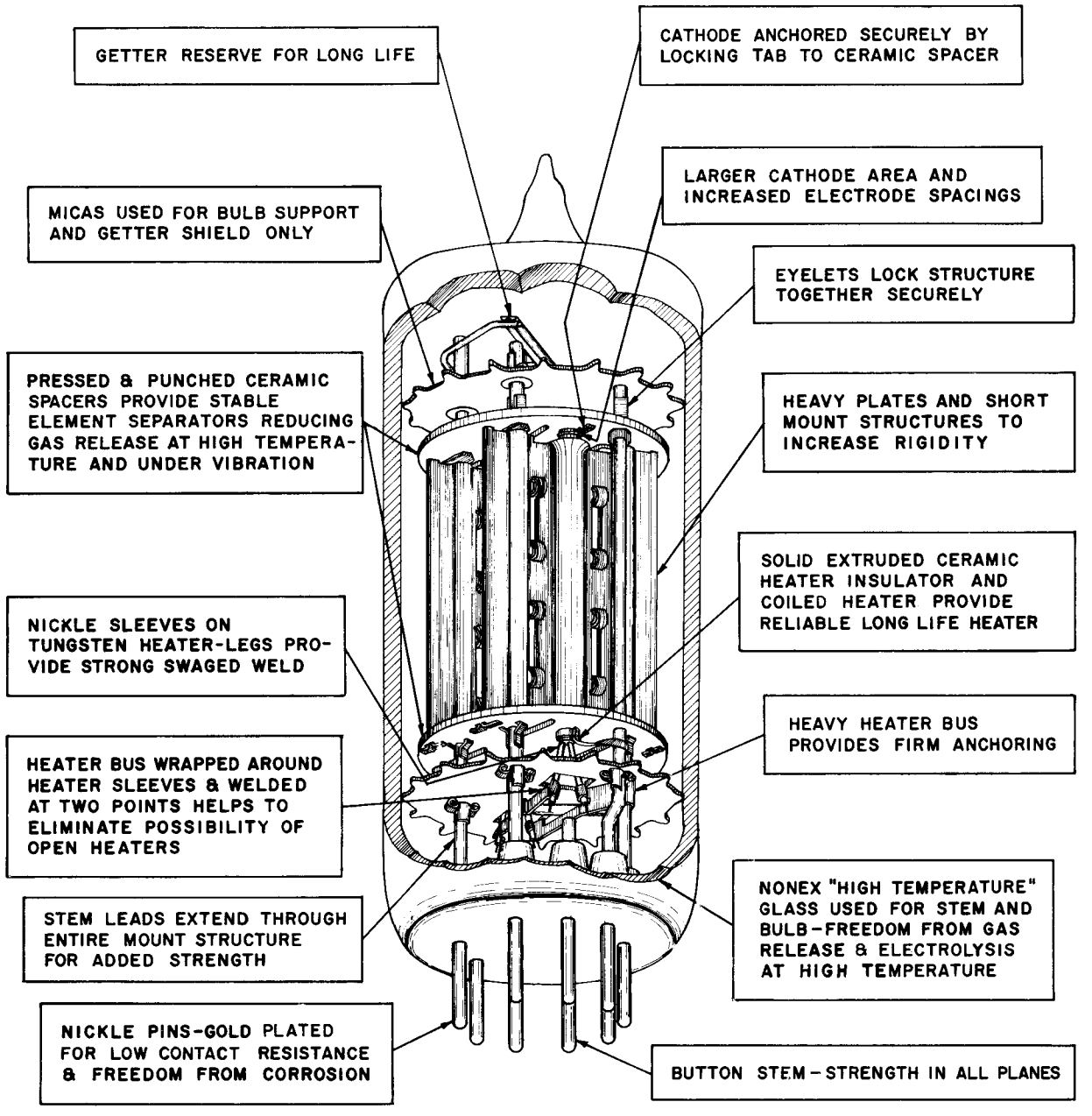

STRUCTURAL FEATURES OF 6754 PROVIDE HIGH RELIABILITY AND LONG LIFE

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